

2

# AN ASSESSMENT OF PRE- AND POST-FITNESS MEASURES IN TWO REMEDIAL CONDITIONING PROGRAMS

AD-A230 365

S. I. Woodruff  
T. L. Conway  
J. M. Linenger

DTIC  
ELECTE  
JAN 09 1991  
S B D

REPORT No. 90-22

Approved for public release distribution unlimited

NAVAL HEALTH RESEARCH CENTER  
P.O. BOX 85122  
SAN DIEGO, CALIFORNIA 92186-5122

NAVAL MEDICAL RESEARCH AND DEVELOPMENT COMMAND  
BETHESDA, MARYLAND



An Assessment of Pre- and Post-fitness Measures in Two Remedial  
Conditioning Programs

Susan I. Woodruff, M.A.  
Terry L. Conway, Ph.D.  
Jerry M. Linenger, CDR, MC, USN

Naval Health Research Center  
Health Services Research Department  
P.O. Box 85122  
San Diego, California 92186-5122

Report No. 90-22 was supported by the Naval Military Personnel Command (N68) under work order No. N0002290WRWW506 and by the Naval Medical Research and Development Command under Research Work Unit No. 63706N.M0095.005. The views presented are those of the authors and do not reflect the official policy or position of the Department of the Navy, Department of Defense, or the U.S. Government.

## Summary

### Problem

OPNAVINST 6110.1 created the Navy's Physical Readiness Program and established minimum standards for physical fitness and body composition which all Navy personnel are required to meet biannually on a Physical Readiness Test (PRT). The OPNAVINST also provides a Basic Exercise Program (BEP) to be used in command-directed physical conditioning programs to assist those who failed the PRT or body fat standards. While the content of the BEP is based on scientifically recommended guidelines and is similar to other physical conditioning programs shown to be effective, no specific evaluation of Navy remedial programs based on the BEP has been conducted.

### Objective

Because of the severe sanctions that can be levied against personnel failing the PRT and body fat standards, it is important to assess the effectiveness of a BEP-based program in reducing body fat and improving PRT performance among Navy personnel. The purpose of this study was to determine if taking part in a command-organized remedial program based on the BEP is effective in reducing body fat, improving failure-specific performance on the various components of the PRT, and improving overall physical fitness level.

### Approach

Remedial physical conditioning programs at a submarine base and an air station were evaluated. Pre- and postprogram PRT results were collected for participants at the submarine base (n=64) and the air station (n=44) to assess changes in the number of curl-ups, number of push-ups, run/walk time, overall classification score, percent body fat, and percent passing the overall PRT.

### Results

In general, comparisons over time showed a trend toward improvement among participants in their performance on PRT fitness components and overall classification score. The effectiveness of a BEP-based remedial program in improving PRT performance was also illustrated by changes in the percent of participants passing the overall PRT at the follow-up test, particularly among those previously failing a PRT fitness component. While results showed improvement in PRT performance among participants in the remedial programs, a meaningful impact on body fat reduction was not consistently demonstrated.

### Conclusions and Recommendations

BEP-based physical conditioning programs can be effective in helping individuals improve their physical fitness and pass the PRT. Commands should continue to provide structured exercise programs geared toward the improvement of overall fitness and PRT performance. These programs should emphasize cardiovascular fitness training inasmuch as the run/walk test is the most frequently failed PRT fitness component. However, current recommendations and requirements regarding remedial conditioning programs for individuals who fail the PRT and for those exceeding body fat standards are inadequate for effective weight/fat reduction. More intensive nutrition education and skills training should be incorporated into programs for those needing to reduce body fat.



OR
<input checked="" type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>
on

Distribution/

Availability Codes

Dist

Avail and/or  
Special

A-1

An Assessment of Pre- and Post-fitness Measures in Two Remedial  
Conditioning Programs

Susan I. Woodruff, M.A.

Terry L. Conway, Ph.D.

Jerry M. Linenger, CDR, MC, USN

As part of a comprehensive health promotion effort, the Chief of Naval Operations promulgated OPNAVINST 6110.1, creating the Navy's Physical Readiness Program. This program emphasizes the need for all Navy personnel to achieve and maintain the highest standard of physical readiness to ensure operational effectiveness in the fleet. To this end, the instruction has established minimum standards for physical fitness and body composition that all Navy personnel are required to meet biannually on a Physical Readiness Test (PRT).

The PRT procedure includes a body composition assessment to determine eligibility to take part in the PRT. Personnel diagnosed as obese (26% body fat or greater for males; 36% or greater for females) are not eligible to take the PRT. Individuals determined to be within body fat standards or overfat (23%-25% body fat for males; 31%-35% for females) are tested on three fitness elements: (1) flexibility as measured by a sit-reach test, (2) muscular strength/endurance as assessed by a 2-minute curl-ups test and a 2-minute push-ups test, and (3) cardiorespiratory endurance measured as the time to complete a 1.5-mile run/walk or to complete a 500-yard swim.

To assist personnel in meeting physical readiness standards, the OPNAV instruction also provides a Basic Exercise Program (BEP). The BEP is a complete physical conditioning program designed to reduce excess body fat and develop/maintain flexibility, cardiorespiratory endurance, and muscular strength. The Commanding Officer of individuals failing to meet acceptable body fat or physical readiness standards is required to provide an effective remedial command-directed physical conditioning program using the BEP as a guide. Service members assessed as overfat or obese and those who have failed an exercise component of the PRT are required to participate in a command-directed program until acceptable body fat levels and/or satisfactory physical readiness standards for all tests are achieved on the official PRT.

#### OPNAVINST 6110.1 Basic Exercise Program

The BEP documentation describes, verbally and pictorially, several types of exercise: warm-up activities, stretching and aerobic exercises, strength conditioning exercises, and cool-down procedures. The purpose of each exercise is given, as well as a description of the body movements involved and recommended frequency, intensity, and duration of exercise sessions. In addition, guidelines for a Progressive Walking Program are provided as an aerobic program for reducing body fat for those individuals exceeding body fat standards.

As an overall physical conditioning and body fat reduction program, the BEP has potential merit. It is well established in the exercise physiology literature that weight loss, body fat loss, and cardiovascular fitness are related to aerobic activity when intensity, duration, and frequency are at an adequate level (American College of Sports Medicine, 1978; Cooper, 1982). The BEP also may be valuable as a means for improving performance on specific physical readiness tests. Maloney and his associates (1986) reported significant improvements in sit-ups, push-ups, and run performance after a 5-week and 16-week physical fitness training program for Army Nurse Corps personnel. In addition, the influence of fitness training on young people and adults has been demonstrated by improvements in run time, measures of physical work capacity, and percent body fat (Halfon & Bronner, 1988; Dwyer, Coonan, Leitch, Herzel & Gaghurst, 1983; Borvin, Cantion, Carter, & Williams, 1979; Wier, Jackson, & Pinkerton, 1989).

While the content of the BEP is based on scientifically recommended guidelines (Cooper, 1982) and is similar to other physical conditioning programs shown to be effective (Maloney et al., 1986; Hills & Parker, 1988), no specific evaluation of Navy command-directed remedial programs based on the BEP has been conducted. Because of the severe sanctions that can be levied against personnel failing the PRT and body fat standards, it is important to assess the effectiveness of a BEP-based program in improving PRT performance among Navy personnel. The purpose of this study was to determine if taking part in a remedial, command-organized program based on the BEP is effective in reducing body fat, improving failure-specific performance on the various components of the PRT, and improving overall physical fitness level.

## Method

### Programs and Participants

The remedial physical conditioning programs at a submarine base and an air station in the San Diego area were evaluated. These two sites were selected because of their representation of different types of commands, their availability to provide information, and because they offered organized, well-supervised programs based on BEP-recommended procedures. The two programs and their participants are described below.

Submarine base. The 24-week remedial physical conditioning program was managed by recreation services at the base gymnasium. The mean age of the 64 participants (all enlisted personnel) was 30.5 years; women comprised 14% of the group. Most participants (surface ship and shore personnel) had recently failed the PRT or the body fat screen, although nine had just-passing overall classification scores or body fat measures, and their participation was most likely geared toward fitness/body fat maintenance and prevention of future PRT failure. Participants were required to meet three times a week at specified times, twice for supervised exercise sessions and once for a lecture covering topics related to health and fitness (e.g., nutrition and diet education). Each 1.5-hour exercise session consisted of a stretching routine and pre-activity warm-up, an overall body conditioning segment emphasizing upper body and abdominal strengthening, an aerobic portion (run/walk or swim), and a brief cool-down. Participants were also encouraged to engage in aerobic activity at least one other day on their own.

A sign-in sheet was used to verify attendance at the required exercise and lecture sessions. A summary of participants' attendance was sent periodically to appropriate Command Fitness Coordinators.

Naval air station. This base-wide fitness training program was intended to operate 24 weeks and was conducted by recreation services at the base gymnasium as part of a larger ongoing health promotion program. The remedial group of 44 participants (all enlisted personnel) averaged 26.7 years of age and was comprised of 23% women. Participants were air squadron personnel, all of whom had failed at least one component of the PRT or had failed to meet body fat standards. The conditioning program was based on the BEP's recommended remedial exercises and procedures, and included a warm-up and stretching period, a strengthening and aerobic exercise segment, and a cool-down portion. Sessions lasted approximately 40 to 45 minutes. The

program was offered at convenient times for active duty personnel and supervision was available 3 to 4 times daily, six days a week. A minimum of three sessions per week was required and participants were asked to sign in as a record of attendance.

Midway through the present study, the program at this site was terminated due to budgetary and personnel cuts within recreation services. Study participants were then started on independent programs (also using the BEP guidelines) overseen by Squadron Command Fitness Coordinators. No attendance was taken during this period.

#### Procedures and Measures

Command Fitness Coordinators provided the research team with participants' initial and follow-up body fat estimates and PRT results from official test cycles. Included in the PRT information were results of the participant's sit-reach test, 2-minute curl-ups test, 2-minute push-ups test, and the 1.5-mile run/walk test. (The swim test, a substitute for the run/walk test, was not taken by any participants.) Other PRT-related measures were total points earned, and an age- and sex-adjusted overall classification rating, computed from points earned on the PRT and employing the following categories: Unsatisfactory, Satisfactory, Good, Excellent, and Outstanding. In addition to these overall classification ratings, members who were medically waived for reasons other than obesity took portions of the PRT and were scored as Pass/Fail on those test components.

Test results were obtained from the initial testing phase in November-December, 1989, and follow-up results were collected during the April-May 1990 test cycle. Remedial conditioning programs at both sites began in January, 1990 shortly after the initial test cycle. In addition to pre- and postprogram PRT results, attendance logs were collected and a rate of attendance was computed for each participant. Attendance rate at the air station program was based on records kept during the first half of the program before it was terminated as the official command remedial program.

#### Analyses

Frequency and percentage distributions of participants' demographics and initial PRT/body fat measures were computed for the two sites. Comparisons were conducted to show the frequency and patterns of body fat and PRT failure at the two sites.

Further analyses were designed to assess the impact of the two remedial conditioning programs on subsequent PRT and body fat scores in terms of both general improvement (i.e., overall improvement irrespective of which specific test was failed) and improvements specific to failed components. A series of paired t tests was performed to assess differences between preprogram and postprogram PRT and body fat scores. Multiple regression procedures were used to assess the relationship between attendance rate and changes in PRT performance. In these regressions, postprogram PRT performance was predicted by attendance rate after forcing preprogram PRT performance to enter the predictive equation first.

### Results

Table 1 shows demographic and initial PRT/body fat scores for participants at both sites. The air station program participants as a group were younger and comprised of proportionately more women than the submarine base group. In terms of PRT performance, the submarine base participants had faster run times, higher total points, higher overall classification scores, and were more likely than air station participants to have passed (i.e., achieved an overall classification rating of Satisfactory or better) on the fitness components of the PRT. On the other hand, air station participants had slightly lower average percent body fat (even though a larger proportion was female) and were more likely to be within body fat standards. It is interesting to note, however, that in both programs a high percentage of participants (74% and 68%) were identified as either overfat or obese. In general, a majority of individuals in both programs did not meet body fat standards. Moreover, a sizable number (39%) of those in the air station remedial program had also failed one or more of the physical readiness tests compared to only 7% at the submarine base. An analysis of attendance rates indicated that submarine base participants had complied with program attendance requirements more so than the air station group.

Because participants in the programs were somewhat different in terms of demographics and initial PRT values and because of differences in the two physical conditioning programs, subsequent analyses were performed separately for the two groups. Furthermore, separate analyses of the two groups provided an opportunity to assess similarities in the pattern of findings from two separate programs that were both based on the BEP.



Table 1

Percentage Distributions and Averages of Demographics and Initial Scores for  
Enlisted Navy Participants in Two Physical Conditioning Programs

	Program			
	Submarine Base		Air Station	
	% or Average	n	% or Average	n
<u>Sample Size (%)</u>				
Total	100	64	100	44
Obese, no PRT	20	13	18	8
Provided initial PRT <sup>a</sup>	80	51	82	36
<u>Sex (%)</u>				
Male	86	55	77	34
Female	14	9	23	10
<u>Age (Average)</u>	30.5	54	26.7	44
<u>PRT Scores (Average)</u>				
Curl-ups	46.9	38	46.0	36
Push-ups	33.4	38	33.7	36
Run/Walk Time (Minutes)	13.6	37	15.3	35
Total Points	179	38	165	35
<u>PRT Classification Category (%)</u>				
Outstanding	2	1	0	0
Excellent	5	3	17	6
Good	20	12	16	7
Satisfactory	31	18	8	5
Unsatisfactory	7	4	39	17
Pass, but incomplete PRT	0	0	2	1
Not tested due to obesity	22	13	18	8
Other medical waiver	5	3	0	0
Unknown	8	5	0	0
	100		100	
<u>Average Overall Classification Score<sup>b</sup></u>	1.40	38	1.09	35
<u>Body Composition (%)</u>				
Within standards	26	15	32	14
Overfat	51	29	50	22
Obese	23	13	18	8
	100		100	
<u>Average Percent Body Fat</u>	25.4	57	23.3	44
<u>Attendance (% of total sessions)</u>	79	63	55	23

<sup>a</sup> PRT information was incomplete for some individuals.

<sup>b</sup> Scores ranged from 0 (Unsatisfactory) to 4 (Outstanding).

### PRT Failure Patterns

To examine the possibility of subgroup differences (e.g., those within body fat standards versus overfat, women versus men) in failure patterns and reasons for participation in the remedial programs, additional descriptive analyses were performed. Table 2 presents the percentages of men and women falling into specific fail categories. With only one exception, women were in the remedial programs because they had exceeded body fat standards; the one exception was a failure on the run/walk test. Men were in the programs primarily because they exceeded acceptable body fat standards as well (e.g., 61% at the submarine base and 59% at the air station); however, men were also there because of unsatisfactory PRT performance, chiefly on the run/walk test. This was particularly true of men at the air station of which almost half ( $n=16$ ) had failed the run/walk test.

Table 3 addresses the question of whether there were different patterns of initial PRT failure for individuals with acceptable percent fat levels versus those who exceeded acceptable fat levels. Among initially overfat individuals, failure on any component of the PRT was rare, with 24 of the 25 passing the PRT at the submarine base and 19 of the 22 passing at the air station. All cases of PRT failure among both within-standard and overfat personnel involved unsatisfactory performance on the run/walk test. Overall, failure on more than one test component was uncommon with the exception of five air station personnel who had failed the curl-ups, push-ups, and run/walk tests.

### General Improvement

Analyses were performed to assess group changes over time in body composition and PRT performance considering all participants in each program, irrespective of specific test failure. Participants' pre- and postprogram scores were compared for the curl-ups test, push-ups test, run/walk test, overall classification, body weight, and percent body fat. Results of paired  $t$  tests, presented in Table 4, showed that participants in the submarine base program significantly increased the number of curl-ups and push-ups performed on the follow-up PRT test. Average run/walk time decreased, overall classification score increased, and there was a marginally significant ( $p=.055$ ) decrease in percent body fat. For the air station group, the change was statistically significant ( $p=.04$ ) for the mean overall classification score and nonsignificant for the curl-ups, push-ups, and run/walk test.

Table 2  
Reasons for Participation of Enlisted Navy Men and Women  
in Two Physical Conditioning Programs

	Program			
	Submarine Base		Air Station	
	%	n	%	n
<u>Overfat Total</u>	45	29	50	22
Men	45	25	44	15
Women	44	4	70	7
<u>Obese Total</u>	20	13	18	8
Men	16	9	15	5
Women	44	4	30	3
<u>Sit-reach Failure Total</u>	2	1	0	0
Men	2	1	0	0
Women	0	0	0	0
<u>Curl-ups Failure Total</u>	2	1	14	6
Men	2	1	18	6
Women	0	0	0	0
<u>Push-ups Failure Total</u>	2	1	16	7
Men	2	1	21	7
Women	0	0	0	0
<u>Run/Walk Failure Total</u>	5	3	39	17
Men	5	3	47	16
Women	0	0	10	1
<u>Other Medical Waiver Total</u>	5	3	0	0
Men	5	3	0	0
Women	0	0	0	0
<u>Maintenance/Prevention</u>				
(Within Standards) Total	14	9	0	0
Men	16	9	0	0
Women	0	0	0	0

Note. Total percent for each category is based on the total number of participants, the percent of men in each category is based on the total number of men in the program, and the percent of women in each category is based on the total number of women in the program. Sum of total percents will not equal 100 because individuals could have more than one reason for participation in the program.

Table 3

Initial PRT Failure Patterns for Navy Enlisted Within-Standard and Overfat  
Participants in Two Physical Conditioning Programs

	Number of Participants Failing			
	Submarine Base		Air Station	
	Within Standard	Overfat	Within Standard	Overfat
<u>Test(s) Failed</u>				
Run Only	0	0	7	2
Sit-Reach/Run	1	0	0	0
Curl-ups/Run	0	1	1	0
Push-ups/Run	1	0	1	1
Curl-ups/Push-ups/Run	0	0	5	0
No PRT Failure	9	24	0	19
Total	11	25	14	22

Table 4

Results of Paired t tests Comparing Body Composition and PRT Results for Navy Enlisted Participants Before and After Two Physical Conditioning Programs

	Submarine Base					Naval Air Station				
	Pre- Program	Post- Program	t	p	n	Pre- Program	Post- Program	t	p	n
<b>All Participants</b>										
<b>PRT Scores</b>										
Curl-ups	48.2	55.5	-3.96	.000	29	46.5	54.9	-1.68	.108	22
Push-ups	33.5	41.4	-4.69	.000	29	32.6	41.2	-1.84	.079	22
Run/Walk	13.57	12.55	3.22	.003	29	15.43	14.90	.38	.710	21
Overall Classification <sup>a</sup>	1.53	2.13	-3.84	.001	30	1.09	1.77	-2.19	.040	22
<b>Body Composition</b>										
Weight (lbs)	205.8	205.1	.47	.645	34	182.9	183.8	-.48	.638	33
Percent Body Fat	25.4	24.4	1.96	.055	50	24.8	23.7	1.21	.235	33
<b>Within Body Fat Standards</b>										
<b>PRT Scores</b>										
Curl-ups	45.7	49.2	-2.44	.058	6	30.5	52.5	-2.34	.052	8
Push-ups	35.0	40.7	-2.51	.054	6	23.5	47.4	-2.50	.041	8
Run/Walk	14.40	12.71	1.64	.162	6	17.08	13.97	2.16	.068	8
Overall Classification	.86	1.57	-3.87	.008	7	.00	1.40	-2.94	.016	10
<b>Body Composition</b>										
Weight	204.3	210.4	-3.24	.018	7	163.9	167.1	-1.32	.223	9
Percent Body Fat	20.0	21.5	-1.72	.116	11	13.0	15.3	-.95	.375	8
<b>Overfat</b>										
<b>PRT Scores</b>										
Curl-ups	49.0	57.7	-3.75	.001	22	55.6	56.2	-.13	.897	14
Push-ups	32.4	41.5	-4.36	.000	22	37.8	37.6	.04	.966	14
Run/Walk	13.34	12.48	2.71	.013	22	14.42	15.48	-.53	.608	13
Overall Classification	1.77	2.32	-2.66	.015	22	2.00	2.08	-.25	.809	12
<b>Body Composition</b>										
Weight	203.2	201.9	.77	.450	23	187.9	187.3	.17	.864	16
Percent Body Fat	25.4	23.9	2.36	.026	29	26.8	25.6	1.13	.275	17
<b>Obese</b>										
<b>Body Composition</b>										
Weight	223.5	214.3	1.72	.184	4	194.4	195.8	-.63	.548	8
Percent Body Fat	31.2	29.1	2.24	.052	10	32.4	28.1	4.06	.005	8

<sup>a</sup>Unsatisfactory = 0, Satisfactory = 1, Good = 2, Excellent = 3, Outstanding = 4

Although results generally did not reach statistical significance with the exception of the overall classification score, it should be noted that the magnitudes of change on the curl-ups, push-ups, run/walk, and body fat tests were very similar to those changes in the submarine base participants. Thus, the lower number of significant results may be attributed in part to the smaller sample size of the air station group. Lastly, body weight mean values showed no reliable change in either group.

Similar t-test analyses were performed for individuals within different body fat categories to assess differential PRT/body fat improvements among these groups (Table 4). Individuals within body fat standards in the submarine base program showed significant improvements in overall classification scores. The number of curl-ups and push-ups also improved for this group, although the mean differences were marginally significant. There was also a significant weight gain of approximately six pounds in this group.

Air station personnel within body fat standards showed significant improvements in number of push-ups and overall classification score, with marginally significant improvements in curl-ups and the run/walk test. As shown in Table 4, the initial overall classification score for this group was 0 (Unsatisfactory) because everyone in this subgroup had failed at least one component of the PRT. The follow-up mean overall classification score was 1.40, a value between Satisfactory and Good.

Overfat individuals in the submarine base program demonstrated significant improvements on the curl-ups, push-ups, and run/walk tests as well as on the overall classification rating. There also was a small yet significant reduction (1.5 percentage points) in body fat. Overfat participants in the air station program showed no significant differences over time on the PRT or on the body fat measure.

Because individuals diagnosed as obese are medically waived from taking the PRT, only body composition comparisons were made for this group. Obese participants at the submarine base and air station showed a reduction in body fat of 2.1 and 4.3 percentage points, respectively. Changes in weight over time were not statistically significant.

#### Overall Percent Passing and Failure-Specific Changes

A series of analyses was conducted comparing the percent of individuals passing the overall PRT before and after participation in their respective programs. An individual's value for this variable was either a 1 (based on

an overall classification rating of Satisfactory, Good, Excellent, or Outstanding) or a 0 (based on an Unsatisfactory overall classification rating, a diagnosis of obesity, or an unknown/no show status). Group means on this variable are equivalent to the percentage of individuals passing the PRT at that test cycle.

Figure 1 shows pre-to-post changes in percent passing for the total submarine base group as well as for those overfat, obese, and those who failed at least one component of the PRT but were within body fat standards. For the total group, percent passing the PRT significantly increased from 60% to 78% ( $t(49)=-2.14$ ,  $p<.05$ ). Of the four individuals who initially failed the PRT due to unsatisfactory performance on one or more of the test components, all passed the subsequent PRT. Five of the 11 individuals initially failing due to obesity were subsequently within testable body fat standards and passed the follow-up PRT ( $t(10)=-2.89$ ,  $p<.05$ ). The change (decrease of 4%) in percent passing among overfat participants was not statistically significant. Thus, although there was mean improvement on the PRT components among the submarine base overfat group (see Table 4), the percent passing the PRT did not increase from the pre- to the postprogram. The slight decrease in percent passing among the overfat was attributed to three individuals moving into the obese category and one participant failing the run/walk test.

The percent of the total air station participants passing the PRT increased from 44% to 62% (Figure 2). Although this was a nonsignificant finding ( $t(33)=-1.53$ ,  $p=.14$ ), the increase of 18 percentage points was notably similar to the increase for the submarine base group. A majority (64%) of the 11 individuals who initially failed one or more components of the PRT proceeded to pass the follow-up test. In addition, half of the eight air station participants diagnosed as obese prior to the remedial program were within overfat standards at the second test cycle and passed the PRT ( $t(7)=-2.65$ ,  $p<.05$ ). While almost all of the 16 overfat air station participants had passed their initial PRT (94%), the percent passing among this group fell to 69% on the subsequent test. Although this finding was not statistically reliable, it is of interest to note that the decrease was attributed to four individuals moving into the obese category.

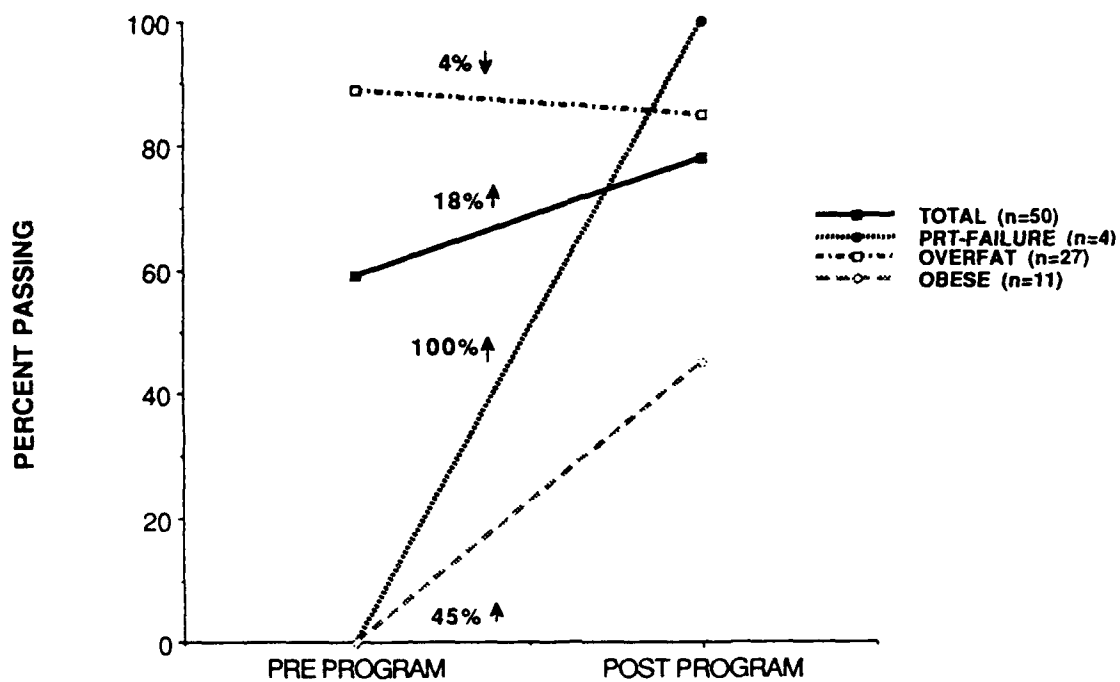


FIGURE 1. PERCENT OF PARTICIPANTS PASSING THE PRT AT SUBMARINE BASE

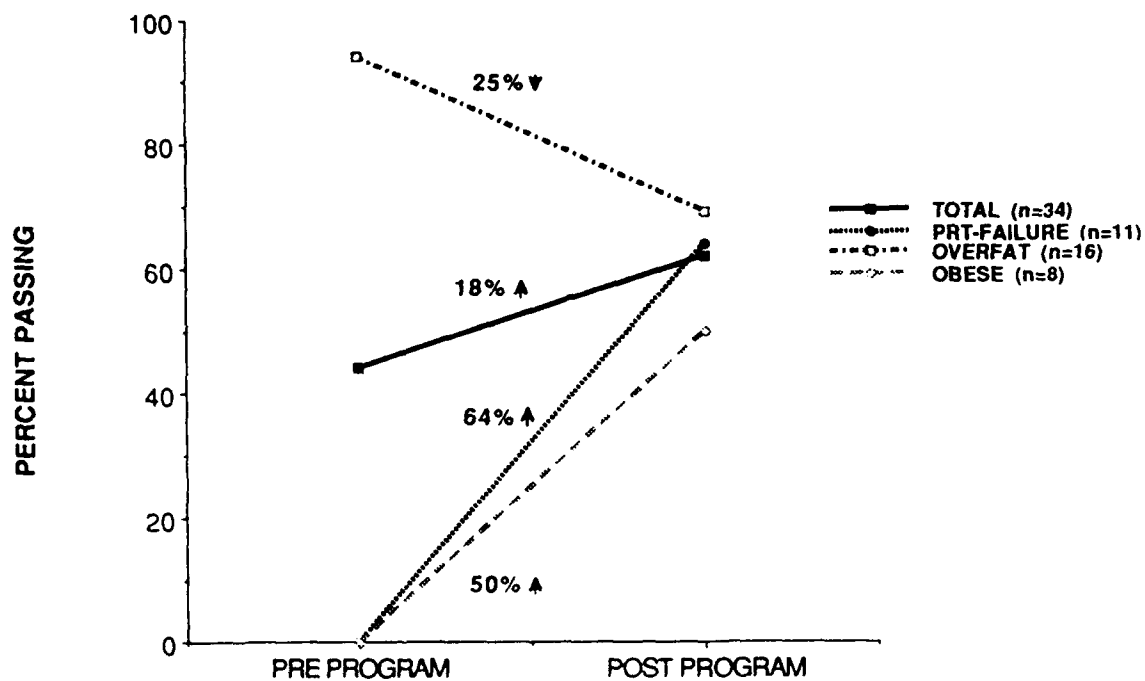


FIGURE 2. PERCENT OF PARTICIPANTS PASSING THE PRT AT NAVAL AIR STATION



### Association between Attendance and Improvement

Several regression analyses were performed to determine the relationship between program attendance (i.e., percent of sessions attended) and improvement on the curl-ups, push-ups, and run/walk tests; overall classification rating; and percent body fat measure. Follow-up test scores were predicted from attendance after controlling for the effects of initial test scores. Attendance was not significantly associated with improvement on any of the PRT/body fat measures at either site.

### Discussion

Overall findings from this study indicate that command-directed physical conditioning programs can be an effective means of helping individuals improve their physical fitness. In general, performance on the Navy's physical readiness test improved after attending a BEP-based program. However, the findings were less positive with respect to the effectiveness of BEP-based programs at helping people reduce their body fat. Although some overfat and obese individuals lost a small amount of body fat, some individuals originally within body fat standards increased their weight/body fat over the course of program attendance. Some overfat individuals became obese, and only about half of obese participants lowered their body fat to nonobese levels.

Analyses of failure patterns showed that most participants were taking part in the program because of excess body fat or failure on the run/walk component of the PRT. For example, approximately 70% of participants had initially exceeded body fat standards. When failure on the PRT occurred (in about 7% of the participants at the submarine base and 39% at the air station), unsatisfactory performance on the run/walk test was always involved. Almost no women were participants in the programs because of PRT failure; they were there because of excess body fat. Additionally, the vast majority of overfat participants had not failed the initial PRT; rather, they were in the program only because they were overly fat. Thus, for the majority, participation in the remedial conditioning programs was due to unacceptable body fat levels, and to a lesser degree, PRT failure on the run/walk test.

Comparisons over time showed that, in general, participants in the programs (especially those in the submarine base program) improved their

performance on PRT fitness components and overall classification scores. This tendency toward improvement was demonstrated at both sites for those within acceptable body fat standards. However, PRT improvement among the overfat participants was seen only at the submarine base; overfat participants at the air station demonstrated no improvement on any PRT component. Overall, the trend toward improvement on the specific PRT components was more pronounced among the submarine base participants, a difference that may be associated with the shorter duration of the organized air station program.

The effectiveness of a BEP-based remedial program in improving PRT performance was also illustrated by changes in the percent of participants passing the overall PRT at the follow-up test. Most notable was the increase in percent passing among those previously failing a PRT fitness component. The percent passing also increased for the total group in both programs and among obese individuals previously unable to take the PRT. Unlike the aforementioned groups, the percent of overfat participants passing the subsequent PRT declined at both sites primarily because several became obese during the course of the program.

While results indicated improvement in PRT performance among those who had participated in the remedial programs, a meaningful impact on body fat reduction was not consistently demonstrated. Over the course of the program, overfat air station participants as a group showed only a small (1.2%) nonsignificant change in body fat, and submarine base participants lost only a small percent (1.5%) of body fat. These small improvements do not begin to meet the Navy's recommended loss of approximately one percent of body fat every two weeks (OPNAVINST 6110.1D, enclosure 1, page 7). Additional results raise further questions regarding the effectiveness of the BEP-based programs in reducing body fat. For example, several overfat participants moved into the obese category over the course of the two programs. Furthermore, eleven submarine base men who were initially within body fat standards showed an increase in body fat at the subsequent PRT cycle. Although this increase was nonsignificant ( $p < .12$ ), it is of concern because the gain placed them, as a group, close to the overfat category cutoff.

Obese individuals in both programs showed a small body fat reduction, and in some cases the loss was great enough to bring the participant into a testable body fat range. Of particular interest was the difference between

air station overfat and obese participants: while the overfat group showed a nonsignificant loss of 1.2% body fat, the obese group reduced their body fat more than 4%. It may be that, because of the more severe administrative actions that can be exacted against an obese individual versus an overfat individual, obese participants were more motivated to make progress toward meeting body fat standards. The obese participants may have engaged in activities on their own (e.g., extra exercise, restricted diet) to achieve the body fat loss. Even so, while the improvements in body fat among the obese groups were statistically significant, they were small and did not meet the recommended body fat loss rate.

The absence of a demonstrated program impact on body fat is not surprising. Research in the area states that exercise alone is seldom effective in the treatment of obesity and that modification of eating behavior is critical, especially for the severely obese (Kukkonen-Harjula, 1988). Although participants at the submarine base heard a few nutrition lectures (which the air station program did not include), the lectures alone were unlikely to induce the changes in eating behavior needed for meaningful body fat reduction. The use of more intensive life-style change/weight management techniques (e.g., keeping an eating and exercise diary, keeping a weight loss graph, setting a calorie and body fat loss goal) shown to be useful in other studies (Pleas, 1988) may have resulted in greater weight/body fat loss and prevention of further fat gain.

With regard to the lack of association between program attendance and PRT/body fat improvement, one factor to consider is the adequacy of attendance as an indicator of exercise activity. Although some researchers suggest using indicators of compliance other than attendance logs (e.g., physiological measures), attendance seems to be the simplest and most practical measure of adherence to an exercise regimen. A common assumption is that if an individual attends a structured exercise program, that individual is attaining sufficient physiological benefit. However, participants may attend, yet exercise at an inadequate duration or intensity (DiLorenzo, Bargman, Stucky-Ropp, LaFontaine, Frensch, Lawrence, & McDonald, 1990). In addition, when using attendance criteria, the assumption is made that participants who are not attending regularly are inactive. This assumption may be unfounded as individuals may be exercising elsewhere. In fact, exercise outside of program sessions was specifically encouraged.

When interpreting these results and drawing conclusions from them, several limitations in the design of this study should be considered. For example, a "no-treatment" control group was not included because of Navy policy mandating remedial program participation for those personnel failing the physical readiness standards. Additionally, improvements in PRT performance cannot definitively be attributed to participation in the remedial program per se as opposed to other activities individuals may have engaged in irrespective of program attendance. However, the use of activity logs to document exercise engaged in outside of remedial sessions was not feasible for a 6-month study. It is clear, however, that participants improved in their PRT performance, and it is probably fair to assume that improvement was attributable in part to program participation and the exercise activities encouraged both during and outside of program sessions.

Another concern was the small number of participants in the programs being studied. Present findings underscore the likelihood of diversity in the types of people and the remedial needs of participants in various programs. It is also likely that exercise program participants vary in terms of fitness goals, preferences for program structure and exercise activities, and intentions of exercising (Gill, Caruso, & Martin, 1990). The individuals in the small samples studied here may not adequately represent all service members in need of remedial conditioning in terms of demographics, fitness level, or goals and preferences. Furthermore, small sample sizes lead to statistical concerns regarding the reliability of findings. However, because of the similar patterns of change over time between the two sites in terms of both direction and magnitude of change, we believe the trends toward improvement are reliable.

One last consideration is related to the adequacy of the two selected programs in representing other BEP-based command programs. While the BEP guidelines are fairly detailed in the description of a recommended exercise regimen, there is considerable leeway in the design and implementation of command physical conditioning programs. In fact, this latitude was demonstrated in the present study by differences in program content and structure at the two sites. To the extent that the programs selected for the present study do not typify other BEP-based programs, results may not extrapolate to other participants and programs.

### Conclusions and Recommendations

To summarize, the following conclusions are thought to be consistent with the overall findings of the present study, and the recommendations are intended to enhance the effectiveness of BEP-based physical conditioning programs:

1. BEP-based physical conditioning programs can be effective in helping individuals improve their physical fitness and pass the PRT at satisfactory or above levels of performance. Commands should continue to provide structured exercise programs geared toward the improvement of overall fitness and PRT performance. These programs should especially concentrate on cardiovascular fitness training inasmuch as the run/walk test is the most frequently failed PRT fitness component.
2. The current recommendations/requirements regarding BEP-based remedial conditioning programs for individuals who fail the PRT and for those exceeding body fat standards are inadequate for effective weight/fat reduction. More information and skills training regarding nutrition and fat loss should be incorporated into current programs or specialized programs should be developed for those needing to reduce body fat. More intensive nutrition counseling, weight management techniques, short-term individual incentives, and group-based incentives could help circumvent motivational problems and facilitate progress toward meeting body fat standards.
3. Effectiveness of command-directed physical conditioning programs could be enhanced by stronger command support of such programs. Commanding Officers should clearly communicate the importance of physical readiness and their commitment to physical remediation. Top leadership is in a position to make physical readiness a priority and to create an environment that is serious about helping all personnel achieve acceptable levels of fitness.

4. More specific and rigorous requirements for BEP-based programs should be enacted to ensure that individuals meet and maintain physical readiness standards. For example, to increase compliance with program requirements, attendance information should be reported to the individual's command as a matter of course. In addition, it is recommended that attendance record keeping be standardized and made part of the service member's Risk Factor Screening/Physical Readiness Test Results form (OPNAV 6110/2). In this way, continued failure on the PRT or body fat screen as recorded in OPNAV 6110/2 can be viewed in light of attempts at complying with a remedial program. To assure that adequate physical effort is attained during exercise sessions, physiological monitoring (e.g., monitoring of pulse and recovery heart rate as an indirect assessment of submaximal physical work capacity) would be valuable. Further, motivational and behavioral techniques should be employed to a greater extent to increase program participation and fitness status. Strategies such as setting short-term and intermediate exercise/fitness goals, the use of publicly posted charts displaying progress toward goals and participation, inter-team competition, and activity-related incentives have been found to be effective in aiding behavior change. Finally, availability of a post-BEP maintenance program is recommended to help individuals sustain the progress made during the BEP-based physical conditioning program.

## References

- American College of Sports Medicine. (1978). Position statement on the recommended quantity and quality of exercise for developing and maintaining fitness in healthy adults. Medicine and Science in Sports, 10, vii.
- Borvin, G.J., Cantion, A., Carter, B.J., & Williams, C.L. (1979). Reducing adolescent obesity through a school health program. Journal of Pediatrics, 9, 1060-1062.
- Chief of Naval Operations OPNAVINST 6110.1D, "Physical Readiness Program," 18 Jan 1990.
- Cooper, K.H. (1982). The aerobics program for total well-being. New York: M. Evans & Co.
- DiLorenzo, T.M., Bargman, E.P., Stucky-Ropp, R.C., LaFontaine, T., Frensch, P., Lawrence, C., & McDonald, D. (1990). The long term relapse curve for individuals with a prior history of exercise adherence. Paper presented at the annual meeting of the American Psychological Association, Boston, Massachusetts.
- Dwyer, T., Coonan, W.E., Leitch, D.R., Herzel, B.S., & Baghurst, R.A. (1983). An investigation of the effects of daily physical activity on the health of primary school students in South Australia. International Journal of Epidemiology, 12, 308-313.
- Gill, D.L., Caruso, C.M., & Martin, J.J. (1990). Psychological characteristics of exercise program participants. Paper presented at the annual meeting of the American Psychological Association, Boston, Massachusetts.
- Halfon, S., & Bronner, S. (1988). The influence of a physical ability intervention program on improved running time and increased sport motivation among Jerusalem schoolchildren. Adolescence, 23(90), 405-416.
- Hills, A.P., & Parker, A.W. (1988). Obesity management via diet and exercise intervention. Child: Care, Health, and Development, 14, 409-416.
- Kukkonen-Harjula, K. (1988). More exercise for the obese? Annals of Clinical Research, 20, 67-70.

- Maloney, J.P., Cheney, R., Spring, W., & Kanusky, J. (1986). The physiologic and psychological effects of a 5-week and a 16-week physical fitness program. Military Medicine, 151(8), 426-433.
- Pleas, J. (1988). Long-term effects of a lifestyle-change obesity treatment program with minorities. Journal of the National Medical Association, 80(7), 747-752.
- Wier, L.T., Jackson, A.S., & Pinkerton, M.B. (1989). Evaluation of the NASA/JSC health related fitness program. Aviation, Space, and Environmental Medicine, 60, 438-444.



UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE

## REPORT DOCUMENTATION PAGE

1a REPORT SECURITY CLASSIFICATION Unclassified			1b RESTRICTIVE MARKINGS N/A		
2a SECURITY CLASSIFICATION AUTHORITY N/A			3 DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release; distribution unlimited.		
2b DECLASSIFICATION/DOWNGRADING SCHEDULE N/A					
4 PERFORMING ORGANIZATION REPORT NUMBER(S) NHRC Report No.			5 MONITORING ORGANIZATION REPORT NUMBER(S)		
6a NAME OF PERFORMING ORGANIZATION Naval Health Research Center		6b OFFICE SYMBOL (if applicable) Code	7a NAME OF MONITORING ORGANIZATION Chief, Bureau of Medicine and Surgery		
6c ADDRESS (City, State, and ZIP Code) P.O. Box 85122 San Diego, CA 92186-5122			7b ADDRESS (City, State, and ZIP Code) Department of the Navy Washington, DC 20372		
8a NAME OF FUNDING/SPONSORING ORGANIZATION Naval Medical Research & Development Command		8b OFFICE SYMBOL (if applicable)	9 PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER		
8c ADDRESS (City, State, and ZIP Code) NMC NCR Bethesda, MD 20889-5044			10 SOURCE OF FUNDING NUMBERS		
			PROGRAM ELEMENT NO 63706N	PROJECT NO M0095	TASK NO 005
11 TITLE (Include Security Classification) (U) An Assessment of Pre- and Post-fitness Measures in Two Remedial Conditioning Programs					
12 PERSONAL AUTHOR(S) Woodruff, Susan I.; Conway, Terry L.; Linenger, CDR Jerry M.					
13a TYPE OF REPORT Interim		13b TIME COVERED FROM _____ TO _____		14 DATE OF REPORT (Year, Month, Day) 900920	
15 PAGE COUNT 23					
16 SUPPLEMENTARY NOTATION					
17 COSATI CODES			18 SUBJECT TERMS (Continue on reverse if necessary and identify by block number)		
FIELD	GROUP	SUB-GROUP	Physical Readiness Test		
			Physical fitness		
			Percent body fat		
			Navy men and women		
19 ABSTRACT (Continue on reverse if necessary and identify by block number) The purpose of this study was to determine if taking part in a command-organized remedial physical conditioning program based on the OPNAVINST 6110.1 Basic Exercise Program (BEP) is effective in reducing body fat, improving failure-specific performance on the various components of the Physical Readiness Test (PRT), and improving overall physical fitness level. Pre- and postprogram PRT results were collected for participants in a submarine base (n=64) and an air station (n=44) BEP-based remedial program to assess changes on the following PRT elements: curl-ups test, push-ups test, run/walk time, overall classification score, body fat, and percent passing the overall PRT. In general, comparisons over time showed a trend toward improvement in performance on PRT fitness components, overall classification score, and percent of participants passing the overall PRT at the follow-up test. While results showed improvement in PRT performance among participants in the remedial programs, a meaningful impact on body fat reduction was not consistently demonstrated.					
20 DISTRIBUTION/AVAILABILITY OF ABSTRACT <input type="checkbox"/> UNCLASSIFIED UNLIMITED <input checked="" type="checkbox"/> SAME AS RPT <input type="checkbox"/> DTIC USERS			21 ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED		
22a NAME OF RESPONSIBLE INDIVIDUAL Susan I. Woodruff, M.A.			22b TELEPHONE (Include Area Code) (619) 553-8466		22c OFFICE SYMBOL Code 40

DD FORM 1473, 84 MAR

83 APR edition may be used until exhausted  
All other editions are obsolete

(U) SECURITY CLASSIFICATION OF THIS PAGE

U.S. Government Printing Office: 1985-507-547